

Geologic Landscape and Coastal Assessments Subactivity

Program	1999 Estimate	Uncontrol. & Related Chgs	Program Redirect	Program Changes	FY 2000 Budget Request	Change from 1999
Earth Surface Dynamics	13,555	306	-4,036	0	9,825	-3,730
National Cooperative Geologic Mapping	22,546	566	-3,231	1,500	21,381	-1,165
Coastal and Marine Geology	37,990	744	-6,339	-2,900	29,495	-8,495
Total Requirements \$000	74,091	1,616	-13,606	-1,400	60,701	-13,390

Note: The Program Redirect column reflects the redirection of funds to the Integrated Science, Science Support, and Facilities activities.

National Cooperative Geologic Mapping Program

Current Program Highlights

The National Cooperative Geologic Mapping Program (NCGMP) was created following the passage of the National Geologic Mapping Act of 1992, and reauthorized in 1997 as Public Law 105-36. The Program is the primary source of multiple-purpose geologic maps that depict the distribution of the Nations' sediment and rocks and the resources they provide. Geologic maps are vital in the exploration and development of water and land resources, evaluating and planning for environmental protection, reducing losses from landslides and other ground failures, mitigating effects of coastal and stream erosion, siting of critical facilities, and planning for basic earth science research. The Program provides state-of-the-art digital geologic maps to the Nation in a cost-effective and timely manner through cooperation among Federal, State, Academic, and private-sector earth-science organizations. Priorities and execution of the NCGMP are guided by a Federal Advisory Committee consisting of representatives from Federal and State governments and from the private sector, which meets annually. Progress and status reports on the Program were prepared for the Secretary of the Department of Interior and for the Committee on Resources of the House of Representatives and the Committee on Energy and Natural Resources of the Senate.

The NCGMP supports the Mapping Act through three main program components FEDMAP, STATEMAP, and EDMAP. FEDMAP, the Federal component, consists of 18 regional geologic mapping and synthesis projects which focus on issues of national and regional importance. Government and private-sector clients and cooperators are not only users of program products, but also are involved in program planning. STATEMAP supports geologic mapping studies by State geological surveys through a competitive grant program that matches every

Federal dollar with a State dollar. Mapping priorities are determined with the help of State Mapping Advisory Committees in each state that include representatives from all levels of government, the private sector, academia, and industry. In 1998, 43 states received funds for more than 150 geologic mapping projects across the Nation. In 1999, the number of states participating increased to 45. EDMAP supports the training of a new generation of geologic mappers in universities and colleges across the Nation through a competitive grant program that matches every Federal dollar with a dollar from academic institutions. Both graduate and undergraduate students are encouraged to coordinate their mapping closely with the program scientists in state geological surveys and in the USGS. In 1998, 52 graduate students from 40 universities in 26 states were funded to carry out geologic mapping projects. In 1999, the number of students supported increased to 60 from 41 schools in 29 states and the District of Columbia. Recent accomplishments of all components of the Program are identified below.

Figure G - 4

Recent Accomplishments

National-scale Mapping Efforts

The National Geologic Map Database was developed as part of the National Geologic Mapping Act of 1992 and 1997. In 1996-97 the USGS and the Association of American State Geologists defined the general concepts for the Database, and work began on its construction. This work focused on the development of standards and guidelines to support the management and use of digital map data (see <http://ncgmp.usgs.gov/ngmdbproject>), and building an online catalog of geoscience maps (see <http://ngmdb.usgs.gov>). In 1998, many of these standards and guidelines became available in draft form, including a geologic map data model. Also in 1998, the number of records in the map catalog increased, from about 3 percent to about 53 percent of the USGS collection. An expanded effort to include all maps produced by state geological surveys in the database is supported by the Association of American State Geologists. By the end of FY 2000, 90 percent of USGS and at least 20 percent of all state map products will be included. Development of new standards and procedures in FY 1999 will allow access to digital maps on line. On-line access is of increasing importance to private-sector firms and to government agencies such that customized Geographic Information Systems (GIS) can be used to support land management and economic investment decisions. Expediting the completion of the map catalog and development of on-line access to digital maps are areas for program growth for FY 2000.

The Science in the Parks initiative is an ongoing priority of the Department of the Interior aimed towards maintaining and protecting our National Parks. The NCGMP is the principal USGS partner involved with coordinating and prioritizing geologic mapping studies in cooperation with the National Parks Service. The projects provide geologic maps and unbiased science on issues that range from geologic controls on water quality in the Ozarks and Buffalo River National Scenic Waterways to habitat preservation in Death Valley National Park. These maps and related data contribute to land management, and to inventory and monitoring natural resources. The NCGMP does not take positions on land development or preservation policy, instead the program produces geologic maps and unbiased geological science data and interpretations that are used by others to reach policy and economic decisions. These maps and related data are released to the public and are used by government, industry, and interest groups alike, such that informed decisions are possible.

The Quaternary Atlas of the eastern two thirds of the United States at 1:2.5-million-scale has been compiled and is scheduled for release to the National Atlas of the United States in FY 1999. The map is the premier product from more than a decade of collaboration between State and Canadian Provincial geological surveys, universities, the Geological Survey of Canada, and the USGS. The Quaternary Period includes the time of all activities of man. The rocks, deposits, and materials depicted on the map include the soils and surface mantle of the earth, in which man's activities are concentrated. The map units are distinguished in part on the basis of physical, chemical, and engineering properties, properties that are most applicable to societal use. The map provides a national-scale database for all concerned with shallow ground-water aquifers, sand and gravel construction materials, soil and ground-water contamination, and toxic and other shallow waste disposal.

Similarly, the new Basement Map of North America at 1:5-million-scale has been completed. This map includes the first new compilation of the basement geology of the United States since 1974. The map depicts the rocky basement that underlies the surface of the nation, and shows the distribution of rocks that contain mineral and petroleum resources and deep supplies of ground water, as well as the crystalline rocks that are mined for cement and aggregate. These two maps represent the current state of geologic map information at a national-scale, and they are useful for national-scale planning and analysis; however, they are in no way substitutes for the more detailed geologic maps that are required for land resource decisions at regional and local scales.

Regional-scale Mapping Efforts

The Las Vegas Urban Corridor Project completed 1:100,000-scale geologic mapping of the Las Vegas and Lake Mead 1-degree quadrangles. The map areas include most of the city and suburbs of Las Vegas, Nevada as well as Lake Mead National Recreation Area. Mapping has identified the distribution of permeable strata and fracture zones (which are the pathways for water resources and pollution plumes) and delineated expansive soils, potential flood-hazard areas, subsidence due to ground-water withdrawal, landslides, and earthquake faults and will contribute to planning and zoning efforts by local and state officials. Additionally, the maps aid local water districts in locating ground-water resources and potential areas for artificial ground-water recharge.

The San Francisco Bay Mapping Project is constructing digital databases of surficial and bedrock geology for ten San Francisco Bay area counties. This regional geologic data library is providing customers with on-line access to topical and geographically indexed data. Additionally, a variety of research efforts are continuing to understand and help characterize the hazard potential in the Bay region, in particular hazards associated with different types of landslides and earthquakes associated with strike-slip faults. Detailed, large-scale mapping in regions of fault segmentation helps understanding the where, when and how great earthquakes are initiated. This geologic map information is used by the State for hazard zoning and by industry in planning facilities to minimize risk.

The Appalachian Regional Geology Hydrology Project completed geologic mapping of six 30'x60' quadrangles covering the Washington-Baltimore urban area. Collectively, these geologic maps provide a framework for environmental assessments, urban planning, and future resource and hazard investigations in an area of the Chesapeake Bay watershed that has sustained 3 centuries of urban development. The area was chosen based on input from a public forum held in 1997. Its selection was based on several factors, including societal relevance, customer needs, interagency agreements and partnerships, available staff, and contribution to USGS initiatives. The forum was a significant step in ongoing efforts to promote communication between users and providers of geologic map information and to encourage user input and partnerships in the design of geologic mapping activities and products.

Landslides Mapping Projects — In conjunction with the USGS Landslides and Earthquakes programs and the National Weather Service, and the California Division of Mines and Geology, the NCGMP constructed geologic maps as the framework for landslides hazard assessments in preparation for the 1998 El Niño storm season. The maps were widely used by emergency

response agencies to plan for and respond to landslide and debris flow events in the greater Los Angeles and San Francisco Bay areas that were brought about by the El Niño storms. Mapping in the Southern Appalachians (coordinated with FEMA) is leading to a broad assessment of the little known, yet widespread, and costly landslide hazards in the Southeastern US. This work began in response to the widespread 1995 landslide and debris flow destruction in Madison County, Virginia. Growth of these and related geologic mapping in support of landslide hazard assessment and mitigation is anticipated by the program in the future. The large cumulative costs to taxpayers in disaster assistance that results from landslides, debris flows, and ground-subsidence constitute an issue of national importance. The widely distributed and localized impacts require attention and response at the State, county, and municipal response. Consequently, the development and delivery of geologic maps that address landslide hazards is considered an appropriate role for the Federal-State partnership that is the National Cooperative Geologic Mapping Program.

Detailed Mapping Efforts

Pacific Northwest — New 1:24,000 scale geologic mapping in the earthquake-prone urban corridor of western Washington and Oregon has helped to define areas prone to seismic shaking, ground failure, and damage from earthquakes. This FEDMAP project is determining the distribution and character of earth materials and faulting needed for seismic hazard mitigation for the area. Geologic mapping supported by STATEMAP funds and the Washington Geological Survey, in direct response to the Washington State Growth Management Act, is providing an assessment of landslides, volcanic mud flows, and potential aquifers in western Skagit County. Geologic mapping supported by STATEMAP funds and the Oregon Department of Geology and Mineral Industries in the Chiloquin-Klamath Falls region, is answering geologic questions related to two recent disasters. Mapping in this region will identify local faults, which were clearly active during the destructive earthquakes of 1993, and mapping of surficial deposits will help prevent the interruption of irrigation flows for agriculture, and help protect the quality of surface water.

Southeast Coastal Plain — Geologic and hydrologic framework studies along the southeastern coastal plain of the United States are producing maps that define the three-dimensional structure and continuity of aquifers that supply drinking water in the area. This FEDMAP project will also help to resolve multi-state issues of ground-water quality and salt-water contamination. Partners include the USGS South Carolina Water District office, the Department of Energy, and the South Carolina Department of Natural Resources. Geologic mapping, supported by STATEMAP funds and the South Carolina Geological Survey, is concentrated in the fastest growing recreational and retirement area of the state along the coast. As man's activities come in contact with the fragile estuary ecosystem, the need for geologic mapping increases.

Southern California — Geologic mapping in southern California is defining the structure and history of the San Andreas Fault system and its relation to earthquake hazards. This is a cooperative FEDMAP project with the California Division of Mines and Geology (CDMG), the USGS Water Resources District Office, the Mojave Water Agency, the USGS Earthquakes and Landslides programs, and a long list of additional cooperators. The project also maps ground-water basins in three-dimensions to support the water resource needs of the populous

desert region from the Mexico border through the Los Angeles basin, and eastward into the Mojave Desert. Closely coordinated geologic mapping supported by STATEMAP funds and CDMG is producing detailed maps in Orange and San Diego. These maps are required by state law to be used for planning and development purposes at the county and municipal level. University students supported by EDMAP have been involved in both the FEDMAP and STATEMAP geologic mapping efforts underway in California.

South Florida — Mapping, stratigraphic and paleo-ecologic studies led by NCGMP contribute to the Place-based Studies in South Florida that is coordinated with the Florida Geological Survey (FGS) and a large number of other agencies. The FEDMAP role is in determining the hydrogeologic framework for ground-water flow beneath the Everglades and into Florida Bay, as well as geologic baselines to guide environmental restoration efforts in South Florida. Geologic mapping supported by STATEMAP funds and the FGS allows a better assessment of the vulnerability of various aquifers to contamination in the Arcadia region of west-central Florida.

New Mexico — Recent geologic mapping and geophysical surveys provide important information about detailed patterns of buried faults that offset the Santa Fe Group aquifers in the Middle Rio Grande Basin. The organization of this mapping effort as part of a broad multi-program and multi-agency study of the critical water resources of the Middle Rio Grande Basin dovetails geologic mapping supported by all three components of the program. Students supported under EDMAP work closely with geologists from both the USGS and the New Mexico Bureau of Mines and Mineral Resources. The new surface and subsurface data contributes to a three-dimensional model of the basin structure. The model will allow water allocation plans to be formulated on a more factual and technically rigorous basis and will facilitate more credible and detailed forecasts of the impacts of various water-use policies.

New Partnership Mapping

Anticipating Needs and Aligning Priorities — As this program has matured since its inception with the National Geologic Mapping Act of 1992, and the reauthorization of the Act in 1997, both the USGS and our partners in the State geological surveys have recognized that we must anticipate the needs of geologic map users. To that end, each year the USGS hosts regional workshops in which our customers are asked how they use geologic maps and where their needs are greatest. Only by directly asking these questions is it possible for the program to anticipate their needs. Likewise, the program's partners in the State geological surveys assess the needs of communities through State Mapping Advisory Committees and direct their STATEMAP proposals accordingly. These committee recommendations, results of regional workshops and the advice of the program's multi-sector (Federal, State, private) Federal Advisory Panel, along with the mission responsibilities defined by the National Geologic Mapping Act, guide the development and implementation of the program. Both of the new (FY 1999) FEDMAP projects, the pilot-level Central Great Lakes States Geologic Mapping Coalition and the Central Death Valley Mapping project came about because of the needs expressed by a diverse group of geologic map users.

The Central Great Lakes States Geologic Mapping Coalition is a pilot project of the NCGMP and the State geological surveys of Indiana, Illinois, Ohio, and Michigan to design and

leverage the necessary resources needed to understand the geologic framework and its impact on the economy and sustainability of the urban and agricultural infrastructure of the Great Lakes Region. The economy of the region supports one third of the Nation's population, as well as extensive manufacturing and agricultural industries. Balancing economic, land-resource, environmental and human-health needs in the region requires comprehensive geologic mapping and development of digital geologic maps and Geographic Information Systems that depict in three-dimensions the distribution of the vast blanket of glacial sediments that cover the area. Increasingly, this information is needed by government planners and regulators, as well as industry and private-sector investors to make cost-effective decisions. In the absence of detailed geologic map information and understanding of differences in susceptibility to contamination of the ground-water in the various glacial deposits, costly errors and unnecessary costs are incurred. The coalition of Federal and State partners is seen as an effective way not only to leverage resources, but also to best focus project work on the highest priority issues in the multi-state region.

The central Death Valley region of California and Nevada is the area of principal discharge for regional groundwater flow from an extensive system encompassing 15,000 square miles of southern and central Nevada. A new (FY 1999) project is providing the three-dimensional structural and stratigraphic framework for the area to support regional groundwater flow-model studies. The project coordinates with Department of Energy efforts to develop integrated flow models for the nearby Nevada Test Site and Yucca Mountain nuclear repository. Products include digital geologic maps and GIS databases at 1:24,000 and 1:100,000 scales. Additionally, the project assists the NPS in assessing the geology, geologic hazards and groundwater discharge in Death Valley National Park. The Park Service has significant concerns related to impacts of earthquake and mass wasting hazards on current and future Park development that lie astride the active Death Valley-Furnace Creek fault systems. Large-scale offsets on this fault system are only rivaled by those on the San Andreas Fault.

Justification for Program Change

Community/Federal Information Partnership — The USGS will augment its activities in the production and delivery of digital geologic maps through the National Cooperative Geologic Mapping Program (NCGMP), to provide communities with Internet access to the Nation's vast collection of geologic maps and related information. This effort will expand the development of the Internet-based National Geologic Map Database and the production of National Spatial Data Infrastructure-compliant digital geologic map data that meet community needs to address hazards, resources, and environmental management issues. The map information provided through the database will further be enhanced by development of geologic models that will aid communities in using the data. The activities will be expanded in partnership with State geological surveys and universities. The intent of the USGS is to provide half of the requested funds for this activity to the matching-funds grants components of the program (STATEMAP and EDMAP) to support non-Federal involvement and half to the Federal mapping component (FEDMAP).

	FY 2000 Request	Program Change
\$(000)	21,381	+1,500